

• CLAIMS

What is claimed is:

1. A paper pick-up device of an image forming apparatus, comprising:
 - a paper feeding cassette including a plurality of sheets of paper, the paper feeding cassette having a friction resistance plate, inclined by a predetermined angle to come into contact with a leading end of the paper sheet, to separate the paper sheets one by one;
 - a pick-up roller to rotate in contact with a topmost paper of the paper feeding cassette to convey a topmost paper toward the friction resistance plate;
 - a pick-up bracket to rotationally support the pick-up roller, and having a gear train to transmit a rotational driving force to the pick-up roller; and
 - a pick-up position varying unit to move the pick-up roller to one position among at least two pick-up positions which are pre-set in accordance with the paper characteristics.
2. The paper pick-up device of claim 1, wherein the at least two pick-up positions comprise:
 - a first pick-up position where a distance between the friction resistance plate and the pick-up roller is set to a first distance to allow the pick-up roller to pick-up a paper of strength, and
 - a second pick-up position where the distance is set to a second distance, shorter than the first distance, to allow the pick-up roller to pick-up a paper of low strength.
3. The pick-up device of claim 2, wherein the pick-up position varying unit comprises:
 - a rotary member connected to the pick-up bracket by a shaft to rotate about the shaft, the rotary member having the pick-up roller rotatably disposed on an end thereof;
 - a driving unit to rotationally drive the rotary member to move the pick-up roller between the at least two pick-up positions; and
 - a control unit to detect the paper characteristics and controlling the driving unit based on the detected paper characteristics.

4. The paper pick-up device of claim 3, wherein the driving unit comprises:
a pair of first link members each having first ends linked with both sides of the rotary member;
a pair of second link members each having first ends linked with second ends of the first link members, which are opposite the first ends of the first link members, by a pin;
a shaft fixed to second ends of the second link members, which are opposite the first ends of the second link members;
a third link member having a first end fixed to the shaft between the second ends of the second link members; and
a driving source connected the second end of the third link member, which is opposite the first end of the third link member, to link movement of the first, the second and the third link members.

5. The paper pick-up device of claim 3, wherein the driving unit comprises:
a first link member having a first end linked with a side of the rotary member;
a second link member having a first end linked with a second end of the first link member, which is opposite the first end of the first link member, by a pin;
a shaft fixed to the second end of the second link member, which is opposite the first end of the second link member;
a third link member having a first end fixed to the shaft between the second end of the second link member; and
a driving source connected the second end of the third link member, which is opposite the first end of the third link member, to link movement of the first, the second and the third link members.

6. The paper pick-up device of claim 4, wherein the driving source is a solenoid.

7. A paper pick-up device of an image forming apparatus, comprising:
a paper feeding cassette including a plurality of sheets of paper, the paper feeding cassette having a friction resistance plate, inclined by a predetermined angle to come into contact with a leading end of the paper sheet, to separate the paper sheets one by one;
a pick-up roller to rotate in contact with a topmost paper of the paper feeding cassette to convey the topmost paper toward the friction resistance plate;

a pick-up frame disposed in the paper feeding cassette;
a pick-up bracket movably disposed in the pick-up frame, on an end of which the pick-up roller is rotatably disposed, and inside of which a gear train is provided to transmit a rotational driving force to the pick-up roller; and
a pick-up position varying unit to move the pick-up roller to one among at least two pick-up positions which are pre-set in accordance with paper characteristics.

8. The paper pick-up device of claim 7, wherein the two pick-up positions comprise:
a first pick-up position where a distance between the friction resistance plate and the pick-up roller is set to a first distance to allow the pick-up roller to pick-up a paper of high strength, and
a second pick-up position where the distance is set to a second distance to allow the pick-up roller to pick-up a paper of low strength.

9. The paper pick-up device of claim 7, wherein the pick-up position varying unit comprises:
a conveyance frame reciprocally disposed in the pick-up frame to support a fixed end of the pick-up bracket;
a conveyance unit to linearly reciprocate the conveyance frame; and
a control unit to detect the paper characteristics and controlling the conveyance unit based on the detected paper characteristics.

10. The paper pick-up device of claim 9, wherein a pair of guide bars outwardly protrude from both sides of the conveyance frame, and a pair of guide grooves are defined in the pick-up frame to receive the pair of guide bars, thereby guiding a movement of the conveyance frame in the pick-up frame.

11. The paper pick-up device of claim 9, wherein the conveyance unit comprises:
a rack member provided in the conveyance frame;
a pinion engaged with the rack member; and
a driving source disposed in the pick-up frame to rotationally drive the pinion.

12. A paper pick-up device of an image forming apparatus into which paper is fed, including a friction resistance plate inclined by a predetermined angle to come into contact with a leading end of the fed paper to separate the paper from other paper, comprising:

- a pickup roller to convey the paper toward the friction resistance plate;
- a pickup bracket to rotationally support the pickup roller at a first end of the pickup bracket; and
- a pickup position varying unit to move the pickup roller to pickup positions in accordance with characteristics of the fed paper.

13. The paper pick-up device according to claim 12, further comprising a paper feeding cassette in which paper is stacked and from which paper is fed to the image forming apparatus.

14. The paper pick-up device according to claim 13, wherein the pickup roller rotates in contact with the topmost paper in the paper feed cassette.

15. The paper pick-up device according to claim 14, further comprising a pickup driving source to generate a driving force.

16. The paper pick-up device according to claim 15, further comprising a gear train inside the pickup bracket to transmit a rotational driving force to the pickup roller wherein the gear train comprises:

- a rotational driving shaft penetrating through the pickup bracket at a second end of the pickup bracket opposite the first end of the pickup bracket;
- a pickup gear mounted on the rotational driving shaft to transmit the driving force to the rotational driving shaft; and
- a plurality of gears to transmit the driving force from the rotational driving shaft to the pickup roller.

17. The paper pick-up device according to claim 12, wherein the pickup position varying unit moves the pickup roller to one of at least two positions including a first position at a first distance from the friction resistance plate to pickup up thick paper, and a second position at a second distance from the friction resistance plate, the second distance being shorter than the first distance, to pick up thin paper.

18. The paper pick-up device according to claim 12, wherein the pickup position varying unit comprises:

a rotary member at the pickup bracket to rotate about an axis to a predetermined angle; a driving unit to drive the rotary member to move between the pickup positions; and a control unit to detect characteristics of the paper and control the driving unit based on the detected characteristics of the paper.

19. The paper pick-up device according to claim 18, wherein the rotary member further comprises:

the pickup roller, on a side of the rotary member, to rotate and thereby pickup the paper; and
a pickup roller shaft, coaxial with the rotary member, to transmit rotational force to the pickup roller.

20. The paper pick-up device according to claim 17, wherein the driving unit comprises:

a first link member having a first end linked with a side of the rotary member;
a second link member having a first end linked with the second end of the first link member, which is opposite the first end of the first link member, by a pin;
a shaft fixed to the second end of the second link member, which is opposite the first end of the second link member;
a third link member having a first end fixed to the shaft between the second end of the second link member; and
a driving source connected the second end of the third link member, which is opposite the first end of the third link member, to link movements of the first, the second and the third link members.

- - 21. The paper pick-up device according to claim 17, wherein the driving source is a solenoid.
 - 22. The paper pick-up device according to claim 17, wherein the driving source is an electromagnet.
 - 23. The paper pick-up device according to claim 17, further comprising a sensor to detect the characteristics of the paper and to generate a signal that is transmitted to the control unit.
 - 24. A method of picking up paper sheets having different strengths in an image forming apparatus including a pickup roller and a friction plate, comprising:
 - detecting the strengths of the paper sheets when a printing command is input;
 - determining a pickup position relative to the friction plate based on the detected characteristics; and
 - operating the pickup roller to assume the determined pickup position.
 - 25. The method according to claim 24, wherein the detecting further comprises inputting paper characteristics to a printer driver.
 - 26. The method according to claim 24, wherein the operating comprises:
 - moving the pickup roller near to the friction plate when the paper sheets are thin; and
 - moving the pickup roller away from the friction plate when the paper sheets are thick.
 - 27. A paper pick-up device of an image forming apparatus into which paper is fed, including a friction resistance plate inclined by a predetermined angle to come into contact with a leading end of the fed paper to separate the paper from other paper, comprising:
 - a pickup roller to convey the paper toward the friction resistance plate;
 - a pickup frame;
 - a pickup bracket, movably disposed in the pickup frame, at an end of which the pickup roller is rotatably disposed; and
 - a pickup position varying unit to move the pickup roller to pickup positions in accordance with characteristics of the fed paper.

28. The paper pick-up device according to claim 27, further comprising a paper feeding cassette in which paper is stacked and from which paper is fed to the image forming apparatus.

29. The paper pick-up device according to claim 28, further comprising a cassette mounting portion, provided in a body of the image forming apparatus, in which the paper feeding cassette is mounted.

30. The paper pick-up device according to claim 27, wherein the pickup position varying unit moves the pickup roller to one of at least two positions including a first position at a first distance from the friction resistance plate to pickup up thick paper, and a second position at a second distance from the friction resistance plate, the second distance being shorter than the first distance, to pick up thin paper.

31. The paper pick-up device according to claim 30, wherein the pickup position varying unit further comprises:

a conveyance frame, in the pickup frame, to support a fixed end of the pickup bracket; a conveyance unit to allow the conveyance frame to reciprocate in the pickup frame; and a control unit to detect characteristics of the paper and control the driving unit based on the detected characteristics of the paper.

32. The paper pick-up device according to claim 31, wherein the conveyance frame comprises:

first and second guide bars protruding from a side of the conveyance frame; and a guide groove in the pickup frame to receive the guide bars, thereby guiding the movement of the conveyance frame in the pickup frame.

33. The paper pick-up device according to claim 32, wherein the first guide bar is connected to an end of the pickup bracket and the conveyance frame.

34. The paper pick-up device according to claim 32, wherein the conveyance unit comprises:

- a rack member disposed on the conveyance frame;
- a pinion engaged with the rack member; and
- a driving motor in the pickup frame to drive the pinion.

35. The paper pick-up device according to claim 31, further comprising a sensor to detect the characteristics of the paper and to generate a signal that is transmitted to the control unit.